

Organic Production of Herbs

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1. Organic production

Organic production is an overall system of farm management and food production that combines best environmental practices, a high level of biodiversity, the preservation of natural resources, the application of high animal welfare standards and a production method in line with the preference of certain consumers for products produced using natural substances and processes. The organic production method thus plays a dual societal role, where it on the one hand provides for a specific market responding to a consumer demand for organic products, and on the other hand delivers public goods contributing to the protection of the environment and animal welfare, as well as to rural development (Council Regulation (EC) No 834/2007).

Organic farming is a method of producing crops including herbs with respect to their natural life cycles. It minimizes the human impact on the environment. Organic farming forms part of an extensive supply chain, which also includes food processing, distribution and retailing. In accordance with determined, strict goals and principles, it operates as naturally as possible. The EU market for organic food was valued at 19.7 billion euro in 2011, with a total area of 9.6 million hectares cultivated as organic - up from 5.6 million hectares in 2002.

In organic farming the sequence of crops are rotated so that on-site resources can be used efficiently. Chemical pesticides, synthetic fertilizers, antibiotics and other substances are severely restricted and genetically modified organisms (GMOs) are banned. Disease-resistant plant species adapted to the local environment are used, whereby the on-site resources (e.g. manure for fertilizers) are put to good use.

1.1 Organic Certification

When its production has followed and complied with the specific rules for organic farming as set down in one of the sets of regulations recognized by the international community, a **herb product can be labelled "organic"**.

Producers of herbs must undertake to be inspected (audited) by an independent accredited third party in accordance with the ISO 65 guide standards, e.g.: GLOBALGAP, or ECOCERT (in the USA).

The auditor inspects and certifies the products on the basis of the regulations applicable in the market. Main stages of the process are summarized in Figure 1. These can vary according to countries, e.g.:

- France and Europe: Regulation (EC) No 834/2007 and its implementing regulations (EC) No 889/2008 and No 1235/2008; national or private specifications approved by member states
- United States: NOP (National Organic Program) regulations (Figure 2)
- Japan: JAS (Japanese Agricultural Standard) regulations
- Other national regulations: China, Colombia, India, South Korea, Turkey, etc.

The European Union has elaborated comprehensive **rules** on organic production, processing, distribution, labelling and controls. The main pillars of the **EU POLICY** are policy implementation, standards, and monitoring.

As a result of **EU legislation** 'organic' should have the same meaning for both consumers and producers all over the EU. Legislation on organic production is taking place with the participation of Member States and the assistance of advisory and technical committees and expert bodies.

1.2 The EU rules on organic production

EU-wide regulations cover the entire organic farming supply chain – from production, to control, and labelling. As such, **the Legal framework covers all elements of production including** Plants and plant products, Seeds database – the official resource of databases with suppliers of organic seeds and propagating material. Processed products. **There are even EU rules on the trade of and control of organic produce.**

As a result of the evaluation process, one or several supporting documents (certificate or evidence of certification) will be issued. These documents clearly identify

- The company name and address details of Ecocert SA
- The issuance date
- The company name and address details of the operator
- A list of all organic operation types (main and secondary activity)
- A list of all certified products, associated certification category and validity dates.

The Action Plan for the future of Organic Production in the European Union has set out 18 initiatives in order to achieve certain objectives in developing the organic food market (including herbs and spices), by increasing efficacy, transparency and consumer confidence.

2. Principles of organic farming

In the closest sense, organic farming means an agricultural system that seeks to provide the consumers with fresh, tasty and authentic produce (food) while respecting natural life-cycle systems.

To achieve this, organic farming relies on a number of objectives and principles, as well as common practices. These are meant to minimize the human impact on the environment, while ensuring the agricultural system operates as naturally as possible.

Starting organic herb production, i.e. preparing a herb garden is basically the same as preparing for any other type of organic garden. The most important steps include the followings:

- add compost and/or other organic materials to the soil,
- choose viable and vigorous seedlings/transplants,
- secure optimal growth conditions for healthy plants,
- use mulch to control weeds,
- use only organic pesticides and companion planting to deter the insect population.

3. Typical forms of organic farming practices

Farming practices used are manifold. They include the following main forms:

- Wide crop rotation as a prerequisite for an efficient use of on-site resources
- Absolute prohibition of the use of GMO (genetically modified organisms)
- Choosing disease resistant plant materials that are adapted to local conditions
- Severely restricted use of chemical synthetic pesticides and synthetic fertilizers, livestock antibiotics, food additives and processing aids and other inputs
- Utilization of on-site resources, such as livestock manure for fertilizer or feed produced on the farm
- Raising livestock in free-range, open-air systems and providing them with organic feed
- Organic herb farming is the starting element, a part of a larger supply chain that encompasses food processing, distribution and retailing sectors.

4. Organic Conversion

Producing herbs and spices organically is a long-term process. It consists of stages spanning several years and is not limited to only one growing season. This process is called **transition** and means transition from conventional to organic gardening by adopting organic production techniques. Organic herb farming – generally – also begins with a so called **conversion/transition period**.

The first step in this transition is **improving and maintaining soil fertility or quality**. The transition from non-organic to organic farming takes place within a given period of time, during which the provisions concerning the organic production have been applied.

The soil is a biologically active and dynamic resource that provides plants with mineral nutrients, water and oxygen. Organic matter is an essential ingredient in fertile and healthy soils (with the exception of hydro cultures). Organic matter slows soil erosion, improves soil tilth while preventing soil compaction and crusting. Optimally the organic matter in a healthy soil is 3 to 5 %. It is postulated that potential crop yield could increase by about 12 % for every 1 % increase in organic matter..

The beginning of the Conversion period is marked by the time when organic production standards are strictly met by the operational side, generally, at the date of the notification to the certification body.

The start of conversion should be in respect to the life-cycle of the crops. In the simplest form annual, semi-perennial and perennial plants are distinguished. During the conversion period products may not be sold under the label organic. (Table 1) For these the recommended periods of conversion are summarized in (Table 2).

5. Introduction to the practical aspects of organic herb growing

Organic herb gardening has been grown for centuries. Traditionally, herbs were harvested in the wild from their native populations (habitats). Later on they were domesticated and grown in gardens.

The key to successful organic herb gardening, or organic gardening of any kind, is to understand how nature works and how these plants grow in their natural environments. According to the principles of organic gardening, if we manage to approximate the environment in which plants grow in the wild, we tend to have a healthier and more natural garden.

The most important precondition of successful organic herb gardening is the rich, fertile soil.

It is the soil that by the functioning of its most varied organisms, from earthworms to fungi, provide needed nutrients to plant roots. It is a healthy root system that allows herbs and other plants to create chemicals that repel pathogens and chemicals that attract beneficial bacteria and other soil organisms.

5.1 Essentials of starting an Organic Herb Garden

Many organic herbs can be grown both indoors and outdoors. Indoors, the plants grow in pots or containers, where the growth conditions can/should be controlled for the benefit of the plants.

The successful cultivation of organic herbs requires care and close attention. Generally speaking, however, with the exception of a few special techniques, all of the usual principles of organic gardening apply to herbs.

5.1.1 Soil and soil preparation

Firstly, it should be determined what type of **soil** and moisture conditions the herbs will need. As a rule, the light soils are preferred. When deciding on the location and planning of the garden (garden design) this circumstance should be considered.

The main goal is to insure both healthy environment and growth conditions for the plants.

5.1.2 Companion plants

Growing companion plants can have several benefits, especially by improving (optimal) soil conditions.

Plants (including herbs) growing in the wild, generally, have symbiotic relationships with each other. This also means that specific plants attract specific beneficial insects. Companion plants can also ward off harmful insects.

Aromatic herbs, e.g.: thyme and lavender grow well in the company of members of the cabbage family. Other examples include chamomile and anise that can be beneficial for basil, whereas basil is a good companion plant for oregano. A list of companion plants should be available through the local nurseries.

5.1.3 Container gardening

Containers (planters) are generally used if the gardening space is limited. They are also suitable to lend a special character to the garden.

5.2 Sources of Organic Matter in the Soil

5.2.1 Animal manures

Animal manures are an excellent source of organic matter and nutrients for the soil. Ideally, manure should be composted according to composting standards. Composting stabilizes the nitrogen and reduces the viability of weed seeds and disease pathogens that may be present in the manure. Organically composted manures can be applied anytime. Fresh manure is used in the fall (to fallow land) and should be immediately plowed or incorporated it into the soil. This provides sufficient time for breakdown and ammonia release before crops are planted. Fresh manures must not be applied directly to plants and should not be applied within 90 days before harvest and 120 days before the harvest of plants whose edible part touches ground touches the ground.

The fertility of manures varies widely (Table 3). Poultry manure is usually higher in nitrogen and phosphorus as compared to other manures. Both poultry and dairy manure have fewer weed seeds.

Successful gardeners do not overapply manure. Similar to any fertilizer, manure can leach and pollute groundwater and streams. Also, too much nitrogen from overapplying manures can reduce the yield and quality of many vegetables.

5.2.2 Compost

Compost can be made from various garden wastes, e.g.: lawn clippings, leaves and other plant materials. It is an advantage of composting that in addition stabilizing nitrogen and killing pathogens

and weed seeds, the organic matter enables the use of materials (e.g. raw manure and sawdust) that normally should not be applied directly.

Compost also improves soil structure, soil moisture retention. It reduces nutrient loss, boosts pH and as such can suppress certain diseases. Composting also increases the population of beneficial microbes. Most composts contain 1 to 3 % nitrogen and are generally applied 4 to 8 tons per acre in field herb (vegetable) production, and 20 to 40 tons per hectare (5 to 10 kg/m²) per square foot) in gardens for soil development, with 2-6 kg/m² applied for soil fertility maintenance.

5.2.3 Cover crops and green manures

Cover crops and green manures help build soil quality. Cover crops add organic matter, reduce soil erosion, provide habitat for beneficial insects and spiders, provide nitrogen, suppress weeds and loosen the subsoil. Green manures are cover crops that are plowed into the soil to provide nitrogen to the succeeding vegetable crop.

Cover crops can be established in the fall (September to October) and allowed to grow during the winter and early spring before being plowed in. Cover crops can be interseeded with a fall vegetable crop toward the end of the growing season, which allows the cover crop to get established during the fall vegetable crop harvest. *Popular winter cover crops include annual ryegrass, winter rye, winter pea, wheat, oats, triticale, clovers and hairy vetch.*

Legume cover crops, such as hairy vetch and clovers, fix nitrogen from the air and transform it for use by vegetable crops. Most legumes should be seeded in early fall, whereas grass cover crops can be seeded up to mid-October in Missouri. The following spring, mow or roll the cover crops. Most cereals can be incorporated into the soil when they are 24 inches tall, before head formation. Legumes should be plowed or incorporated into the soil just before full flowering for maximal nitrogen content.

Brassica and mustard cover crops are known for their rapid fall growth, great biomass production and nutrient scavenging ability. They also have potential in pest management as most Brassica species release chemical compounds that may be toxic to soil-borne pathogens and pests. *Although research results are still inconsistent, these cover crops may be worth trying on a small plot for organic pest management.*

Buckwheat is an excellent summer annual green manure.

5.3 Organic fertilizers

The amount of fertilizer applied to any vegetable crop depends on soil type and characteristics (pH, organic matter and cation exchange capacity), previous cropping history and nutrient uptake by the vegetable. For example, heavy-feeding vegetables like tomatoes can remove as much as 50 kg nitrogen per acre each year. Soil should be tested every two years to determine total nutrients within the soil.

Table 3. lists various types of organic fertilizers that can be used to supply nutrients.

5.4 Soil Types

The number of soil varieties is nearly infinite. Similarly, soils are manifold in their compositions: e.g.: in organic matter, rocks size, minerals, pH, and other factors. clay, sand, silt, loam, and peat are some of the most frequently used categories.

A mixture (combination) of sand, silt, clay and organic matter is generally considered to be good soil.

5.5 pH and Herb Gardening

The pH of the soil, the concentration of hydrogen ions ranging between 1- 14 is also a good indicator. Neutral soils have a pH value around pH 7, whereas limestone a very alkaline mineral in a range 8 - 9. Sulfur is an example of a very acidic mineral. Arid regions tend to have alkaline soils and regions with heavy rainfall tend to have acidic soils.

A pH of 6.5 is considered the point where nitrogen, phosphorous, potassium and the trace minerals that plants need for their growth are most easily available to herbs.

5.6 Organic matters in soil and soil acidity

Adding compost to soil can work well, if the soil is out of the ideal pH range. It will also improve soils that are too sandy, have too much clay, or have a low content of organic materials.

Mixing in compost is an efficient way to improve drainage, which is a critical precondition for healthy root development.

Soil acidity can be “eased” by applying limestone.

5.7 Mulching

Mulching can be applied to replace (substitute) for the lack of sufficient humus. There is a saying that “Mulching is nature’s way of composting”.

For this purpose garden waste (e.g. shredded leaves, hay, shredded bark, or other similar substances) can be applied.

Mulching is frequently used to curb the growth of weeds and facilitate moisture retention in the soil. With herbs growing in dry soils this can be an important factor.

Mulch is frequently used even when the soil is in excellent shape. It will contribute to maintaining soil health and productivity.

6 Propagation Materials

According to the current EU regulations, in organic farming, the **use of organic starting material (seeds, cuttings, etc.) is obligatory**. Frequently, however, no sufficient high quality propagation material is available for herbs. In these cases, farmers must rely on conventionally produced seeds, tubers, bulbs or cuttings.

The propagation materials used, however, must be void of diseases. Seed vigour, as well as resistance of seeds and seedlings towards pathogens should be analysed and improved.

7 Types of organic herb gardens

Depending on the facilities and the aim of production organic herbs can be produced either outdoors and/or indoors. The indoors production, due to its limited space conditions, is mainly used to produce crops of higher values (e.g. fresh cut culinary herbs).

7.1 Outdoor herb gardens

Starter plants should be raised from organically grown **propagation materials** (seeds, transplants). These are generally available from nurseries selling organic produce. As a last resort we can simply grow our own propagation materials. Herbs can be propagated by cuttings or divisions taken from other organically grown plants (e.g. lavender, sage).

Most herbs are easily started from seeds indoors, in shallow containers, a month or so before the start of spring.

Herbs like coriander and fennel do, however, best when sown directly in the open garden.

A light, well-drained soil is good for starting the seedlings indoors. When herbs appear established and firmly rooted they can be transplanted to the garden. Water plantlets thoroughly, right after transplanting.

7.2 Indoor herb gardens

Soil is also a key factor for the indoors grown herbs. Generally, a mixture of standard potting soil, a little sand or gravel to ensure appropriate drainage can be used. It is preferable to water plants through the base of their container. For this purpose a filter soaked with irrigation water can be used. A mist sprayer can also be used in order to regulate the amount of water.

Placing herbs in a south-facing glass or plastic foil house or simply in a window will insure that they get enough light.

Potted/container grown perennial herbs can be raised outdoors during the summer to give them a little extra light and fresh air, but annuals will do fine if they are kept indoors. It's also beneficial to change out the soil from time to time even if plants are not root-bound.

8 Organic weed management

Weeds compete with herbs for light, water and nutrients. Weeds also interfere with harvesting and can harbor many diseases. Several strategies in addition to hoeing or hand-weeding can be employed to reduce weed competition.

8.1 Reducing the weed seed bank

Raw manure, immature compost, hay or straw may also contain weed seeds. Clean tillage or harvesting equipment after use to prevent contamination from adjacent fields. Do not allow weeds to flower and ripen seeds (form seed heads). These should be continuously eliminated.

8.2 Mulches and their beneficial effects

Mulches shade the soil to hamper weed seed germination and smother the growth of weeds. Commercially, both organic and plastic mulches are available. Mulches can be deployed throughout the entire growing season.

Please, note that as an alternative, the crop can be seeded or transplanted into an established mulch. This practice is called **conservation tillage**.

Cover crops can be grown during the summer to control/suppress weeds mainly in the fall garden.

8.3 Crop Rotation

Rotating the crops in the garden with cover crops or different types of herbs, as well as vegetables may prevent the buildup of a single persistent weed species and will contribute to the establishment of optimal soil structure and within this, healthy soil life.

8.4 Plant spacing

The critical weed-free period for most warm-season herb crops is about 45 days after planting. After that, plant canopy will be large enough to shade the weeds and suppress their growth. Consequently, early-season weed control is critical. Although, reasonably decreasing the spacing between plants or between rows so that the crop shades the soil rapidly can aid in weed control, this practice may have also detrimental effects on plant growth. It can also provide favorable conditions for plant pathogens (fungi and insects), so that it is to be used with circumspection.

8.5 Cultivation

Garden soil should be tilled three or four weeks before planting. This should allow for weeds to germinate and emerge. Thus, the weeds can be tilled into the soil several times before the crop is established. This technique is called a „**stale seedbed method**”. It reduces the weed population by breaking their natural life-cycle, especially the cycle of emergence.

8.6 Transplanting

Numerous herbs are propagated by transplants. Due to their advantages transplants should be preferred where possible. Their benefits include: a uniform stand of the main crop and a head start of the herbs over any weeds that emerge.

8.7 Flame weeding

Flame weeding, or using a hot flame to kill weeds, is effective for stale seedbed weed removal or weeds that emerge before the herbs. Flame weeding is effective for weed control in slow-germinating herbs, though its use is dangerous and therefore needs special precautions.

8.8 Drip irrigation

Drip irrigation is an efficient technique that is becoming widespread in arid regions and in areas with limited water supplies. Dripwise distributed water by possibly reducing the soil area that receives water has been observed to curb weed emergence.

8.9 Solarization or the use of plastic foil

Spreading clear plastic foil over an area where crops will be planted can suppress weed germination and growth and even some plant pathogens. In areas with warm climates, the plastic should be applied during the hot part of the year. It should be laid down close to the ground and left in place for four to six weeks.

8.10 Organic herbicides

Organic gardeners can use various organic herbicides, including acetic acid (vinegar), citric acid and corn gluten meal to control weeds.

9 Organic insect management

Organic management of insect pests is based on preventing a pest outbreak rather than dealing with the pest after it has spread in the garden. The following techniques can be used to control insects organically:

9.1 Inspect plants

Scout the garden often paying special attention to the border or outside rows. Physically remove any harmful insects found to prevent the population from spreading to adjacent plants.

9.2 Encourage beneficial insects

Create an environment favorable for natural enemies of harmful insects. More than 100 families of insects, spiders and mites contain species that are natural enemies of harmful insects. Plant the borders of the garden in native flowers or plants such as clover or alfalfa to attract beneficial insects such as lady beetles.

9.3 Row covers

Row covers are lightweight, spunbonded fabrics that can be suspended or draped over vegetables to protect them from invasive insects. Row covers are particularly effective in reducing damage by flea beetles and cucumber beetles. Applying row cover to parthenocarpic cucumbers, zucchinis or other vegetables that do not need pollination to fruit can greatly reduce insect damage.

9.4 Trap crops

Plant a less desirable plant close to the garden to attract insects away from the important vegetables in the garden. Destroy the trap crop after it becomes infested with insects.

9.5 Resistant crops

Some varieties or types of vegetables are less attractive to insects. For example, County Fair pickling cucumber is much less attractive to cucumber beetles than most other cucumber varieties.

9.6 Date of planting

Many insects will have peak populations throughout the growing season. Avoid high populations of insects by adjusting the planting date. For example, early-planted crops will have much less worm infestation than late-planted plants.

9.7 Intercropping

Intercropping is the practice when two or more vegetables are grown in the same area during the same growing season. Avoid planting large blocks of any single crop in the garden. Mixing crops can effectively prevent the spread and buildup of harmful insects.

9.8 Keep plants healthy

Healthy plants are better able to survive and produce a good quality marketable crop. This is also true for organic disease management. In the simplest way, infected plants should be removed, right upon they have been observed, e.g.: rost infected pfeffermint plants.

9.9 Sanitation

Remove plants after harvest to prevent them from becoming reservoirs for harmful insects.

9.10 Fall plowing

Plowing the soil after fall harvest exposes insects and insect eggs to birds or facilitate their desiccation during winter freezing and thawing.

10 Organic insecticides

Several organic insecticides are available for use by vegetable gardeners, including Bt (*Bacillus thuringiensis*), pyrethrums, rotenone, insecticidal soaps, diatomaceous earth, neem and horticultural oils. Before using any of the insecticides, the organic certifying agency should be consulted.

10.1 Organic disease management

Plant diseases may seriously stunt or kill vegetable plants. Diseases often appear as leaf spots, wilts, stunts, rusts or lesions that seriously spoil the quality of herbs. The causes can be fungi, bacteria, viruses or mycoplasmas. Occasionally the cause can be a stressful environment. These causes should be carefully analyzed, since the symptoms can be sometimes misleading, e.g.: plants will wilt not only from the lack of water but also from excessive water, in the root zone.

The key to successful organic disease management is prevention, i.e. the use of strategies that can prevent diseases.

10.2 Resistance or tolerance

Whenever possible, disease-resistant varieties should be chosen. Disease resistance means that although a plant may occasionally contract the disease, it will not be seriously affected. Tolerance to a disease means that the plant usually contracts the disease when present but is able to survive despite the infection. Frequently, the seed package contains information on the resistance of the variety, especially for hybrid (F1) varieties.

Herbs, especially the essential oil containing species of the Lamiaceae family are known to be resistant to plant pests and diseases.

10.3 Disease-free transplants

Many herbs can be propagated by transplants. Transplants should be carefully inspected for any spots or lesions on the stems or leaves. (Remove a few transplants from the planting container and inspect their root systems.) Healthy roots are white or light in color, and show no signs of decay or excessive wrapping of the fibrous roots around the root ball.

10.4 Site selection

Herbs are reputed to tolerate extreme (mostly dry) environmental conditions. As a rule, however, they react by healthy growth and development to good soils and favorable growth conditions (fertilization, irrigation, etc.).

Always choose a well-drained soil. Root rots and other soil-borne diseases thrive in wet soils. Too dense crop stands, similarly to low areas (spots) in the field also are pockets of high humidity in the plant canopy, creating a favorable environment for diseases. Similarly, planting close to trees or buildings that may reduce air circulation or the intensity or duration of sunlight should be avoided. Raised beds can be used to promote soil aeration and drainage whenever possible

10.5 Crop rotation

Crop rotation is a long-established, successful agricultural practice. Continuous cropping of related plants, i.e. plants belonging to the same botanical family, allows for buildup of disease organisms. Herbs and vegetables that are in the same botanical family should not be grown in the same area for at least three years. E.g.: seedless curbis, watermelon, cucumber, squash, cantaloupe and pumpkins belong to the Cucurbitaceae family and often are attacked by the same disease organisms. Rotating curcurbits with vegetables in the Solanaceae family such as peppers, tomatoes, eggplants or potatoes can potentially lower the incidence of diseases.

Several herbs are, however, biannual or even perennials, so that their inclusion in the crop rotation cycle needs special atattention and planning.

10.6 Plant spacing and training

Dense plantings can often increase susceptibility to diseases. By increasing the spacing between plants, air circulation and light intensity are enhanced, creating a less favorable environment for disease development. Always stake or cage tomato plants to keep the plants and fruit from touching the soil. Remove suckers (lateral buds) up to the node below the first fruit cluster on a tomato plant to increase air circulation and light exposure and thus reduce disease incidence.

10.7 Mulching

Organic mulches such as straw, hay, compost, newspaper or wood shavings will aid in disease prevention by reducing direct contact between soil and the plant. Mulch thickness should be 4 to 6 inches. Many soil-borne diseases infect the plant from rain-splashed soil on the lower leaves. Organic mulches usually lower soil temperatures. Thus, warm-season vegetables such as tomatoes and peppers should be mulched only after the soil has warmed. Plastic mulches also can be used by organic growers. Plastic mulches are available in a variety of colors and are particularly effective in warming the soil. Black plastic is the most commonly used plastic mulch for spring and early summer vegetables in Missouri. Infrared-transmitting (IRT) plastic mulch allows certain wavelengths to penetrate the plastic, increasing the soil temperature significantly more than black plastic mulch. Growers wishing to plant later in the summer can use white plastic to keep the soil cooler. When plastic mulch is used, water must be supplied by a drip tube or soaker hose under the plastic.

10.8 Virus infected plants

Eliminate, root out and destroy, any plant showing severe disease symptoms to prevent the spread to adjacent plants. Plants infected by viruses should be removed from the garden immediately.

10.9 Sanitation

The carryover of plant diseases from one growing season to the next should be prevented. All planting trays and growing supplies such as wooden tomato stakes, planting trays and harvest containers should be cleaned. Materials can be soaked in a hydrogen peroxide solution or steam sterilized.

Plant residues in a garden should be cleaned and removed. Diseased plant residue are not to be composted.

Weeds around the perimeter of the garden should be also eliminated because these can serve as hosts for plant diseases.

10.10 Seed saving

Many diseases are seed borne. As a common practice, organic gardeners save seed from favorite varieties. In this practice, the plants from which the seeds were harvested should be inspected to secure that they have no disease symptoms.

Do not save seeds from a hybrid variety because the plants from those seeds usually segregate and thus produce a mixed crop.

10.11 Organic pesticides

Organic fungicides used for vegetables e.g.: copper (Bordeaux mixtures or sulfates) and sodium bicarbonate (baking soda) can usually be applied. When using baking soda, take care of the the buildup of sodium, which can be toxic to plants.

Essential oils are becoming more popular. E.g.: high concentration (70 %) of Neem oil can be used to kill powdery mildew and other spores.

Other types of so called biological fungicides, which are beneficial bacteria or fungi, are also available to organic gardeners. Most organic fungicides are applied to prevent the development of a disease.

The Organic Materials used must be reviewed and approved by the official licencing institute (check out for the regularly updated lists of approved and disqualified organic materials).

12. Summary

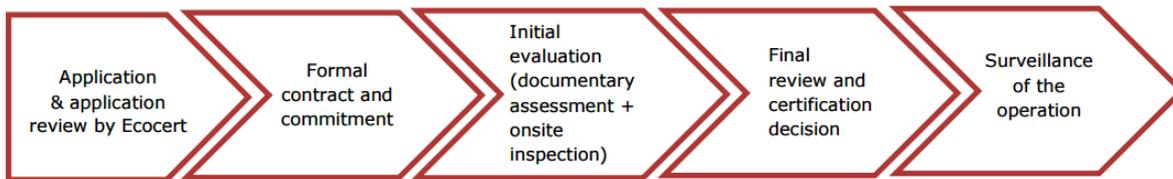
Organic farming is a method of producing crops including herbs with respect to their natural life cycles. It minimizes the human impact on the environment. The organic production of herbs and spices follows the same principles as the production of other vegetable or field crops.

Organic production is an overall system of farm management and food production that combines best environmental practices, a high level of biodiversity, the preservation of natural resources, the application of high animal welfare standards and a production method in line with the preference of

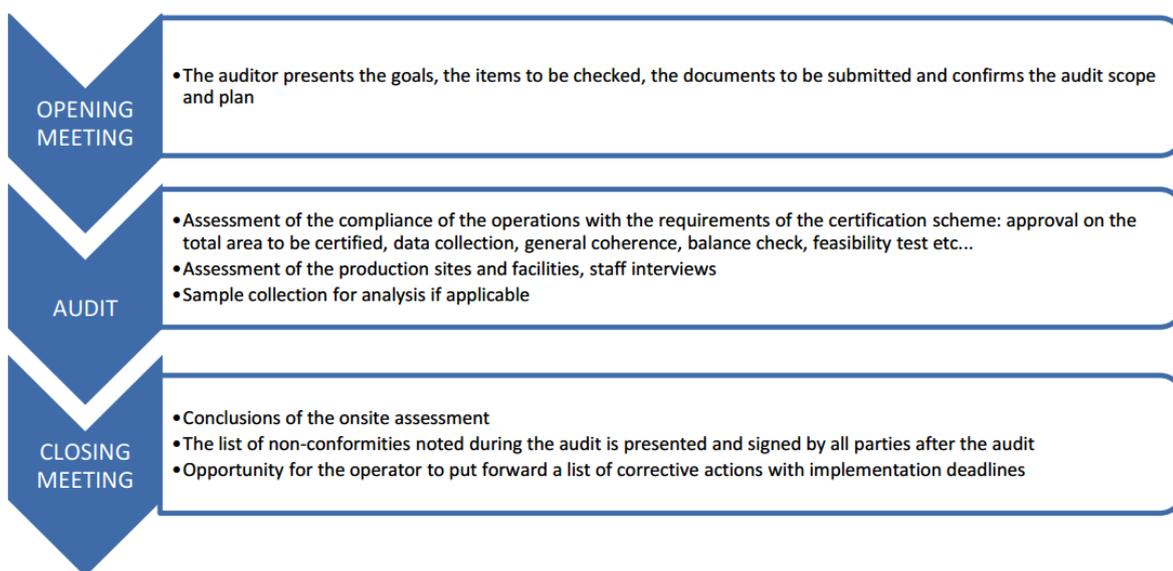
certain consumers for products produced using natural substances and processes. It provides for a specific market for organic products, and it also delivers public goods contributing to the protection of the environment and animal welfare, as well as to rural development

In the European Union well described regulations and certification systems govern the production, processing and marketing of these crops. As several herbs and spices are utilized in either fresh state or dried form, the quality assurance systems for these crops has to be with special regards to sanitary, as well as health conditions of herbs including microbiological contaminations.

1. Figure Main stages as well as conclusions of the certification process (ECOCERT, 2015)



b) Stages and main conclusions of the Audit Process (ECOCERT, 2015)



Audit conclusions

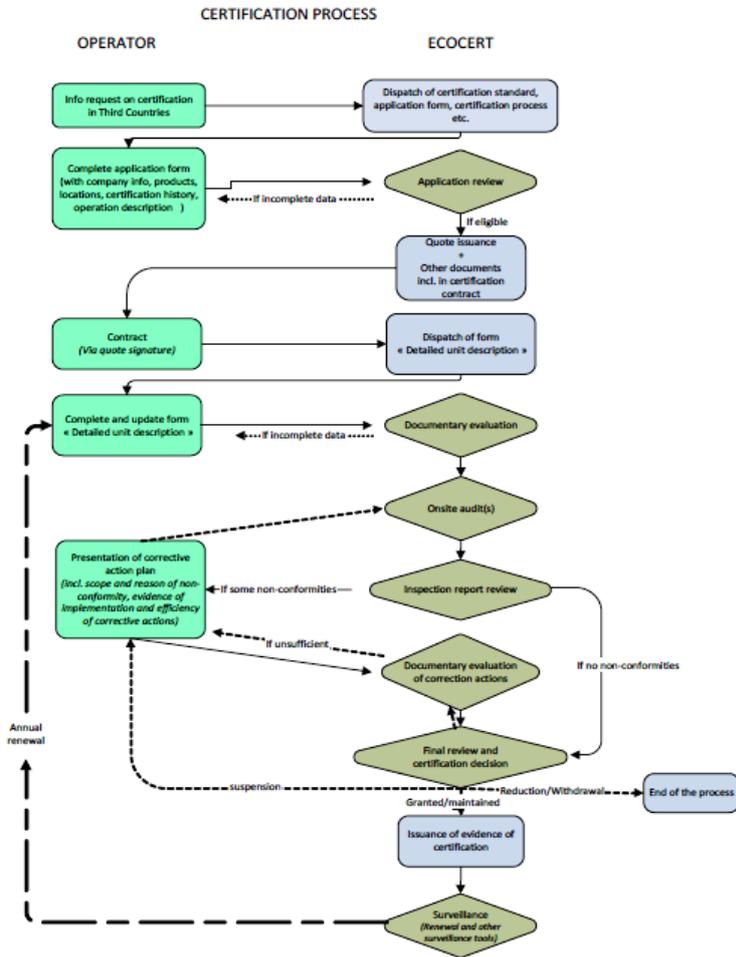
During the audit, non-conformities with the requirements of the standard may be noted. These will require follow-up actions from the operator (so called “corrective actions”) in order to achieve compliance. At the end of the audit, a detailed listing of all non-conformities that may have been noted is to be signed by both the auditor and the operator. Finally, the detailed audit report and test results (if applicable) will be submitted to ECOCERT for full review. When non-conformities have been noted, the operator will receive a written notice listing all non-conformities and the relevant further evaluation tasks required to check that the designated non-conformities have been duly corrected.

2. Figure The Certification Process according to ECOCERT (EOS, 2008)



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ANNEX 2: Certification process flowchart (EOS)



1. Table Duration of the conversion period of various crop types After ECOCERT (2014)

Types of crops	Period Conversion	Products may be sold as 'inconversion'	Products may be sold as 'organic'
Annual and semi-perennial	24 months	If harvest falls 12 months after conversion start date on a designated plot of land	If sowing falls 24 months after conversion start date on a designated plot of land
Perennial	36 months	If harvest falls 12 months after conversion start date on a designated plot of land	If harvest falls 36 months after conversion start date on a designated plot

2. Table Major constituents of animal manures (ECOCERT, 2015)

Manure type	Nitrogen (N)	Phosphorus (P ² O ⁵)	Potassium (K ² O)	Calcium (Ca)	Organic matter	Water content
Undried						
Cattle	0.5 %	0.3 %	0.5 %	0.3 %	17 %	80 %
Sheep	0.9 %	0.5 %	0.8 %	0.2 %	30 %	65 %
Poultry	0.9 %	0.5 %	0.8 %	0.4 %	30 %	65 %
Horse	0.5 %	0.3 %	0.6 %	0.3 %	27 %	69 %
Swine	0.6 %	0.5 %	0.4 %	0.2 %	16 %	78 %
Dried						
Cattle	2.0 %	1.5 %	2.2 %	2.9 %	70 %	8 %
Sheep	1.9 %	1.4 %	2.9 %	3.3 %	54 %	11 %
Poultry	4.5 %	2.7 %	1.4 %	2.9 %	59 %	9 %

Note: each 50 kg of fresh cattle manure contains 0.1 kg of available nitrogen and each 50 kg pounds of dried cattle manure contains about 1 kg of available nitrogen.

3. Table Regulations on organic agriculture in force in the European Union

[Council Regulation \(EC\) No 834/2007](#) on organic production and labelling of organic products and repealing regulation (EEC) No 2092/91

[Commission Regulation \(EC\) No 889/2008](#) laying down detailed rules for the implementation of Council Regulation (EC) No 834/2007 on organic production and labelling of organic products with regard to organic production, labelling and control

[Commission Regulation \(EC\) No 1235/2008](#) laying down detailed rules for implementation of Council Regulation (EC) No 834/2007 as regards the arrangements for imports of organic products from third countries

Decree No 79/2009 (of 30. June) Decree of the Ministry of Agriculture and Rural Development on detailed rules of certification, production, marketing, labelling and control of agricultural products and foodstuffs according the requirements of organic farming

4. Table Popular herbs in organic greenhouse production

Herb	Type or cultivar	Recommended Propagation Method	Comments
Sweet basil (A)	Genovese, Italian Large Leaf, Thai, Mammoth	Seed	The most popular herb. Be careful not to start too early. Remove flowers as they appear for greater leaf production.
Dwarf basil (A)	Spicy Globe	Seed	See above.
Purple basil (A)	Dark Opal, Purple Ruffles	Seed	See above.
Chives (P)	Grolau	Seed	Be careful not to start too early. Rose-pink flowers borne in spring/summer. Chefs prefer fine-leaved types, but thick-leaved types hold up better in packages.
Cilantro (A)	Santo, Jantar	Seed	Easier to harvest if planted in clusters.
Dill (A)	Fernleaf	Seed	Ready for sale at 6–8 inches high. 'Dukat' is extra bushy.
Lavender (M)(P)	Munstead, Grosso	Cuttings	Seed does not come true to type.
Sweet marjoram (M)(P)		Cuttings	Best to use cuttings of true <i>Origanum majorana</i> . USDA has released hybrid <i>Origanum x majoricum</i> hardy to Zone 6
Mint (P)	Peppermint, spearmint, pineapple mint	Cuttings	May be erect or trailing. Many foliage variations. Can be invasive. Variegated good as ornamentals.
Oregano (M)(P)	Greek	Cuttings	Those with white flowers are preferred.
Parsley (A)	Curly	Seed	Can be used in containers. Makes a good edging plant. Technically a biennial, it's grown as an annual.
Parsley (A)	Flat leaf, cv. Italian Dark Green	Seed	Best for culinary use. Because of its fine flavor, prices are usually higher than for curly type.
Rosemary (M)(P)		Cuttings of a good-flavored variety	Erect and trailing forms available. Erect forms are best for culinary use. 'Arp,' while winter-hardy, is not recommended for culinary use.
Sage (M)(P)	Dalmation is best for fresh-cut herbs.	Seed or cuttings	Common sage is usually grown from seed; those with colored foliage are usually grown from cuttings. Erect and spreading forms. Suitable for containers. Try 'Purpurescens,' 'Tri-color,' or 'Aurea' for potted ornamentals.
Scented geraniums (A)	Lemon, peppermint, rose	Cuttings	Flowers of scented geraniums are smaller and less showy than those of bedding geraniums.
Tarragon (P)	French	Cuttings	Requires dormancy. Unusual growth pattern. "Russian" tarragon is of no commercial value.
Thyme (M)(P)	Lemon, French, English, silver, creeping, winter.	Cuttings	Cuttings ensure true-to-type. Best flowering is on older plants. Slow to grow back after cutting.

M = Mediterranean herb; A = Annual; P = Perennial

5. Table Seeding rate for select cover crop species (ECOCERT, 2015)

Species	Depth	Seeding rate		
		Drilled	Broadcast	
		Pounds per acre	Ounces per square 100 feet	
Legumes				
Annual ryegrass	0 to 1.2 cm	10 to 20	20 to 30	1
Barley	1.8 to 5 cms	50 to 100	80 to 125	3 to 5
Oats	1.2 to 3.7 cm	80 to 110	110 to 140	4 to 6
Rye	1.8 to 5 cm	60 to 120	90 to 160	4 to 6
Wheat	1/2 to 1-1/2 inches	60 to 120	60 to 150	3 to 6
Buckwheat	1/2 to 1-1/2 inches	48 to 70	50 to 90	3 to 4
Sorghum-sudangrass	1/2 to 1-1/2 inches	35	40 to 50	2
Brassicas				
Mustards	1/2 to 3/4 inches	5 to 12	10 to 15	1
Radish	1/4 to 1/2 inches	8 to 13	10 to 20	1
Rapeseed	1/4 to 3/4 inches	5 to 10	8 to 14	1
Legumes				
Berseem clover	1/4 to 1/2 inches	8 to 12	15 to 20	2
Cowpeas	1 to 1-1/2 inches	30 to 90	70 to 120	5
Crimson clover	1/4 to 1/2 inches	15 to 20	22 to 30	2 to 3
Field peas	1-1/2 to 3 inches	50 to 80	90 to 100	4
Hairy vetch	1/2 to 1-1/2 inches	15 to 20	25 to 40	2
Medics	1/4 to 1/2 inches	8 to 22	12 to 26	2/3
Red clover	1/4 to 1/2 inches	8 to 10	10 to 12	3
Subterranean clover	1/4 to 1/2 inches	10 to 20	20 to 30	3
Sweetclovers	1/4 to 1 inches	6 to 10	10 to 20	1-1/2
White clover	1/4 to 1/2 inches	3 to 9	5 to 14	1-1/2
Woollypod vetch	1/2 to 1 inches	10 to 30	30 to 60	2 to 3

Source: *Managing cover crops profitably (3rd edition)*, 2007. Sustainable Agriculture Network. A. Clarke (ed.).

6. Table Nutrient content of selected organic fertilizers. (ECOCERT, 2015)

Material	N	P ² O ⁵	K	Other nutrients	Relative availability of nutrients
Rock phosphate	0 %	25 %	0 %	25 % Ca	Slow
Greensand	0 %	0 %	9 %		Slow
Alfalfa pellets	3 %	0.5 %	3 %		Slow
Bone meal (raw)	2 %	15 %	0 %	20 % Ca	Slow
Fish emulsion	4 %	2 %	2 %	1 % Ca	Fast
Blood meal	13 %	0 %	0 %		Slow
Wood ashes	0 %	2 %	5 %	20 % Ca	Fast
Soybean meal	7 %	2 %	2 %		Medium
Cottonseed meal	7 %	2 %	2 %		Slow
Compost	1.5 %	1 %	1.5 %	2 % Ca	Slow
Epsom salts	0 %	0 %	0 %	10 % Mg	Fast
Gypsum	0 %	0 %	0 %	22 % Ca; 16 % S	Medium
Corn gluten	9.5 %	0.5 %	0.5 %		Medium

Adapted from: Ferro, D. N., ed., 1998 to 1999 New England Vegetable Management Guide, University of Connecticut, University of New Hampshire, University of Maine, University of Rhode Island, University of Massachusetts and University of Vermont.

13. References

- Watts and Associates. 2002. Market Opportunities and Strategic Directions for Specialty Herbs and Essential Oil Crops in Montana. Prepared for: Montana Department of Agriculture, Billings, MT; USDA Federal-State Marketing Improvement Program, Washington, D.C. p. 42. www.ams.usda.gov/TMD/FSMIP/FY2000/MT0294.pdf
- Clarke A. (ed.) 2007. Managing cover crops profitably (3rd edition) Sustainable Agriculture Network.
- Ferro, D. N. (ed.) 1998. 1998 to 1999 New England Vegetable Management Guide, University of Connecticut, University of New Hampshire, University of Maine, University of Rhode Island, University of Massachusetts and University of Vermont

Annex I. Main definitions used in the documents on organic regulations

- (a) 'organic production' means the use of the production method compliant with the rules established in this Regulation, at all stages of production, preparation and distribution;
- (b) 'stages of production, preparation and distribution' means any stage from and including the primary production of an organic product up to and including its storage, processing, transport, sale or supply to the final consumer, and where relevant labelling, advertising, import, export and subcontracting activities;
- (c) 'organic' means coming from or related to organic production;
- (d) 'operator' means the natural or legal persons responsible for ensuring that the requirements of this Regulation are met within the organic business under their control;
- (e) 'plant production' means production of agricultural crop products including harvesting of wild plant products for commercial purposes;
- (f) 'livestock production' means the production of domestic or domesticated terrestrial animals (including insects);
- (g) the definition of 'aquaculture' is that given in Council Regulation (EC) No 1198/2006 of 27 July 2006 on the European Fisheries Fund
- (h) 'conversion' means the transition from non organic to organic farming within a given period of time, during which the provisions concerning the organic production have been applied;
- (i) 'preparation' means the operations of preserving and/or processing of organic products, including slaughter and cutting for livestock products, and also packaging, labelling and/or alterations made to the labelling concerning the organic production method;
- (j) the definitions of 'food', 'feed' and 'placing on the market' are those given in Regulation (EC) No 178/2002 of the European Parliament and of the Council of 28 January 2002 laying down the general principles and requirements of food law, establishing the European Food Safety Authority and laying down procedures in matters of food safety
- (k) 'labelling' means any terms, words, particulars, trade marks, brand name, pictorial matter or symbol relating to and placed on any packaging, document, notice, label, board, ring or collar accompanying or referring to a product;
- (l) the definition of 'pre-packaged foodstuff' is that given in Article 1(3)(b) of Directive 2000/13/EC of the European Parliament and of the Council of 20 March 2000 on the approximation of the laws of the Member States relating to the labelling, presentation and advertising of foodstuffs
- (m) 'advertising' means any representation to the public, by any means other than a label, that is intended or is likely to influence and shape attitude, beliefs and behaviours in order to promote directly or indirectly the sale of organic products;
- (n) 'competent authority' means the central authority of a Member State competent for the organisation of official controls in the field of organic production in accordance with the provisions set out under this Regulation, or any other authority on which that competence has been conferred to; it shall also include, where appropriate, the corresponding authority of a third country;
- (o) 'control authority' means a public administrative organisation of a Member State to which the competent authority has conferred, in whole or in part, its competence for the inspection and certification in the field of organic production in accordance with the provisions set out under this Regulation; it shall also include, where appropriate, the corresponding authority of a third country or the corresponding authority operating in a third country;
- (p) 'control body' means an independent private third party carrying out inspection and certification in the field of organic production in accordance with the provisions set out under this Regulation; it shall also include, where appropriate, the corresponding body of a third country or the corresponding body operating in a third country;
- (q) 'mark of conformity' means the assertion of conformity to a particular set of standards or other normative documents in the form of a mark;
- (r) the definition of 'ingredients' is that given in Article 6(4) of Directive 2000/13/EC;
- (s) the definition of 'plant protection products' is that given in Council Directive 91/414/EEC of 15 July 1991 concerning the placing of plant protection products on the market [\(8\)](#);
- (t) the definition of 'Genetically modified organism (GMO)' is that given in Directive 2001/18/EC of the European Parliament and of the Council of 12 March 2001 on the deliberate release into the environment of genetically modified organisms and repealing Council Directive 90/220/EEC [\(9\)](#) and which is not obtained through the techniques of genetic modifications listed in Annex I.B of that Directive;
- (u) 'produced from GMOs' means derived in whole or in part from GMOs but not containing or consisting of GMOs;
- (v) 'produced by GMOs' means derived by using a GMO as the last living organism in the production process, but not containing or consisting of GMOs nor produced from GMOs;
- (w) the definition of 'feed additives' is that given in Regulation (EC) No 1831/2003 of the European Parliament and of the Council of 22 September 2003 on additives for use in animal nutrition
- (x) 'equivalent', in describing different systems or measures, means that they are capable of meeting the same objectives and principles by applying rules which ensure the same level of assurance of conformity;
- (y) 'processing aid' means any substance not consumed as a food ingredient by itself, intentionally used in the processing of raw materials, foods or their ingredients, to fulfil a certain technological purpose during treatment or processing and which may result in the unintentional but technically unavoidable presence of residues of the substance or its derivatives in the final product, provided that these residues do not present any health risk and do not have any technological effect on the finished product;

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- (z) the definition of 'ionising radiation' is that given in Council Directive 96/29/Euratom of 13 May 1996 laying down basic safety standards for the protection of the health of workers and the general public against the dangers arising from ionising radiation and as restricted by Article 1(2) of Directive 1999/2/EC of the European Parliament and of the Council of 22 February 1999 on the approximation of the laws of the Member States concerning foods and food ingredients treated with ionising radiation
 - (aa) 'mass catering operations' means the preparation of organic products in restaurants, hospitals, canteens and other similar food business at the point of sale or delivery to the final consumer.
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